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Testing Unsteady Bernoulli's Equation: an Undergraduate Laboratory Project

We propose a low-cost experiment to test the transient water flow from a pipe connected to a tank, in the time interval between the opening of a valve and the onset of steady state, as predicted by the unsteady Bernoulli's equation. Data are collected with the help of the open-source video analysis software Tracker, and the experiment is suitable for an undergraduate laboratory project. It is found that the functional form of the velocity vs. time dependence of the flow in the transient stage is well represented by the unsteady non-viscous Bernoulli's equation. However, to better understand the details of the parameters involved in the experiment, Bernoulli's equation with losses also becomes useful, thus providing insight into different forms of one of the most important equations in hydrodynamics.

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